Whitebark Pine in British Columbia: Current Conditions and the State of Our Efforts

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Over the past few years studies on whitebark pine in British Columbia (BC) have greatly increased our knowledge of the range, habitat and survival of this species. A brief synopsis of the state of whitebark pine is given along with a summary of current research underway in the province.

There is little work published regarding whitebark or limber pines in BC prior to 1967 when Day produced a paper on whitebark pine in the Rocky Mountains. The two most notable points about this paper are that Day berates the foresters of the day for overlooking the utility of whitebark pine in pursuit of other species. Also, there is not one mention of mortality due to white pine blister rust (WPBR) even though by that time the rust must have been present for a couple of decades. It took another 20 years before Ogilvie (1990) produced his reference work on the ecological characteristics of whitebark pine in BC. More recently, a relative flurry of studies have been published starting with Stuart-Smith's (1998) thesis on conservation of whitebark pine in the Canadian Rockies. Campbell and Antos (2000) followed with a broader examination of the ecology and condition of whitebark pine across a large portion of BC. Zeglen (2002) looked specifically at the result of WPBR activity across the range of whitebark pine in the province.

The last two papers quite neatly summarize the recent condition of whitebark pine in its northern range. Overall, almost 1 in 5 whitebark pine in BC are dead, split evenly between mortality from WPBR and other or undetermined factors (see Fig. 1). Another 1 in 3 trees are currently infected by WPBR. Of these, two-thirds have stem cankers, a usual precursor to death by rust. The remaining half of the population shows no infection at this time, although there are the myriad physical defects (e.g., dead or broken tops) that affect the reproductive ability of mature trees.

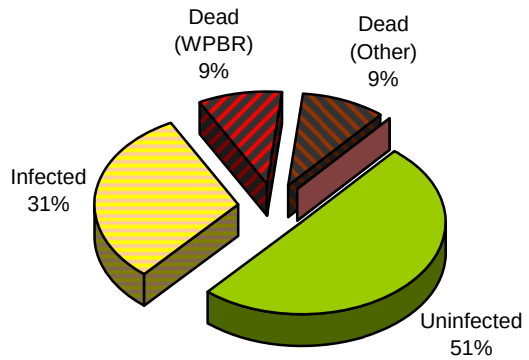

Fig. 1. Condition of whitebark pine in BC.

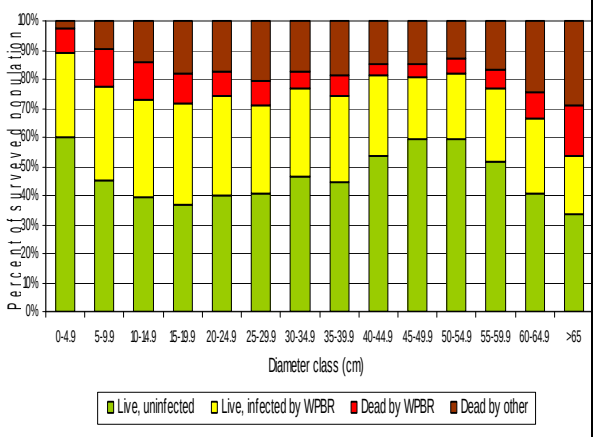

Fig. 2. Condition of whitebark pine in BC by diameter class.

The incidence of WPBR and mortality varies greatly by location across the province and by diameter of the trees affected. Overall, smaller trees (<5 cm dbh) are less affected by WPBR but that can fluctuate greatly as tree diameter increases (see Fig. 2). Some areas, like Cathedral Provincial Park, showed low WPBR incidence (11.5%) and mortality (1.5%) values across the diameter range while the southern Rockies area was consistently high for both (44.9 and 29.9%, respectively). One troubling aspect of areas with high amounts of WPBR is that often very few live large diameter trees remained signifying that natural repopulation of these areas will be difficult. If one were to imagine a transect from the west to the east across the southern portion of BC, one would note a general trend toward increasing amounts of WPBR infection and mortality as one crossed each of the six mountain ranges from the Coast Range to the Rockies.

Losses to mountain pine beetle, a voracious killer of many native pines in western North America, were found to be low in both studies (<0.5% of trees). However, since the time of these surveys the population of mountain pine beetle in the province has exploded into what is considered the largest recorded insect epidemic ever in North America, covering over 9 million hectares (Westfall 2005). The huge influx of beetles has pushed up the hillsides threatening whitebark pine habitat that is usually insulated from more moderate outbreaks. At this time, the impact of the outbreak on whitebark pine is unknown and will likely not be fully quantified until the outbreak subsides, likely after 2008.

Whitebark pine regeneration (trees <1.3 m dbh) is, for the most part, remarkably uninfected compared to larger trees (see Fig. 3). Unfortunately, the amount of regeneration is often not great with half of the survey plots installed in the Zeglen (2002) study showing no regeneration at all even in areas with mature whitebark pine present. A further third of the plots contained only a few (1-5) trees. This reflects the natural difficulty in getting this species to regenerate (i.e., slow maturity, infrequent cone crops, competition for seed from predators, difficult environment, etc.) overlaid with the additional problem of WPBR and beetles killing mature trees. In many areas the most frequently found regeneration is subalpine fir, a climax species. This suggests that unless some sort of beneficial disturbance occurs, whitebark pine regeneration, and even established trees, will find it difficult to perist on many of these sites.

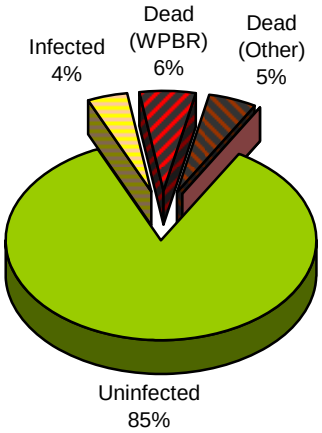

Fig. 3. Condition of whitebark pine regeneration.

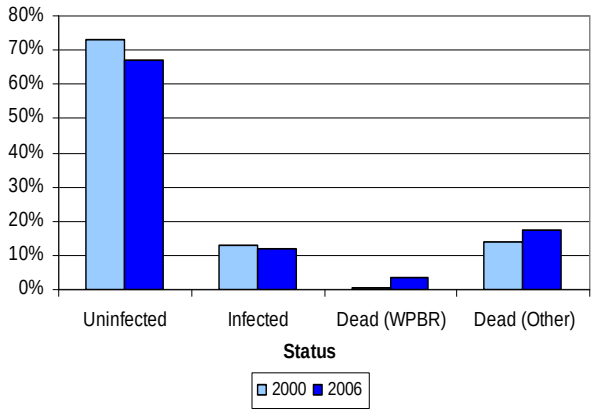

Fig. 4. Preliminary survival data from three monitoring plots in the Coast Range.

While these and other surveys have outlined the current incidence of infection and mortality of whitebark pine, there is little information regarding the rate of mortality. A few long-term monitoring plots have been installed but these are too new to yield much information. A recent examination of some plots that I have has shown a gradual increase in mortality of whitebark pine at three sites along the Coast Range over the last five years (see Fig. 4). The increase works out to roughly 1% per year with most being attributable to the action of WPBR. The apparent leap in the amount of WPBR-caused mortality is mainly due to our ability to definitively identify and track infections rather than having to guess post-mortem. These results are very preliminary and should be taken with a huge grain of salt.

On a positive note, there has been a tremendous amount of interest in studying BC whitebark pine in the new millennium. Most of this effort is centred in universities, often in conjunction with the UBC Centre for Gene Conservation headed by Sally Aitken. Two of her graduate students have recently completed their work; Jodie Krakowski (2003) studied conservation genetics of whitebark pine and Andy Bower (2006) recently completed his PhD studying several aspects of the species that he describes elsewhere in this workshop. Other ongoing studies include Randy Moody's Master's-level study examining the post-fire regeneration of whitebark pine and a PhD-level dendrochronolgy study of whitebark pine dynamics by Carmen Wong (both from UBC). Elizabeth Campbell (BC Ministry of Forests and Range) is also midway through an evaluation of the impact that mountain pine beetle is having on whitebark pine during the current epidemic. Parks Canada also has an active whitebark pine program in the Rockies headed by Cyndi Smith.

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